Proceedings of the Iowa Academy of Science

Volume 36 | Annual Issue Article 49

1929

A Theory of Solubility

P. A. Bond
State University of Iowa

mum within a range of 75° to 85°C. Tin shows an accumulation of sturdy corrosion product above 75°C while the chromium steel (Super-ascoloy) shows no apparent change.

COE COLLEGE,
CEDAR RAPIDS, IOWA.

THE HEATS OF ADSORPTION OF ORGANIC VAPORS ON CHARCOAL AT 25° AND 50°

G. H. REED and J. N. PEARCE

The method of Pearce and McKinley, [J. Phys. Chem., 32, 360-79 (1928)] has been used to determine the heats of adsorption of certain organic vapors on charcoal at 25° and 50°. The vapors used — carbon tetrachloride, chloroform and methylene chloride — were chosen with the purpose of ascertaining the possible effect both of the molecular configuration and the number and nature of the substituents upon the heat of adsorption.

The results thus far obtained make possible only two conclusions: (1) if there is a temperature coefficient of heat of adsorption it is very small, and (2) the successive addition of chlorine atoms to a molecule does not produce a regular variation in the molecular heat of adsorption.

The heat of adsorption increases as the number of chlorine atoms in the molecule is increased.

STATE UNIVERSITY OF IOWA,
IOWA CITY, IOWA.

A THEORY OF SOLUBILITY

P. A. BOND

The theory supposes that solubility is due to two forces; first, one which tends to arrange substances into the lattice forms which they would have in the solid state, second, to thermal forces tending to break up such lattice forms.

The fundamental assumption is made that lattice forms consisting of combinations of solvent and solute must tend to form where solution exists.

It is shown that an ideal solution based on tendencies to form lattice structures between solute and solvent equal to those of the original solute and solvent conforms to Raoult's Law.

Double layers, complex-ions, hydrolysis, etc., find ready explanation by the theory.

STATE UNIVERSITY OF IOWA,
IOWA CITY, IOWA.

A SUMMARY OF OXIDATION-REDUCTION POTENTIALS

A. FERRIC-FERROUS ELECTRODE.
B. MERCURIC-MERCUROUS ELECTRODE.
C. MANGANESE DIOXIDE ELECTRODES.

STEPHEN POPOFF, A. H. KUNZ, J. A. RIDDICK, and W. W. BECKER

a. The Standard Oxidation-reduction Potential of the Ferric-ferrous electrode was determined from electromotive force measurements of the cell:

$$Pt,\ H_2,\ HCl,\ HCl + FeCl_3 + FeCl_2,\ Pt$$

The concentration of the hydrochloric acid was kept the same in both half cells in each series but the concentration of the ferric and ferrous salts was varied keeping the ratio equal to one. The acid concentration in the series consisted of 0.05, 0.1, 0.2, 0.5 and 1 molal hydrochloric. From inspection of the equation

$$E = E_0 - 0.05915 \log \frac{C_{Fe'''}}{C_{Fe''}} - 0.05915 \log \frac{\gamma\, Fe'''}{\gamma\, Fe''} \pm E_1$$

it can be seen that the terms to the right of E_0 must be made equal to zero in order that E may equal E_0. By suitable mathematical, experimental, and graphical treatments, the foregoing were reduced to zero, and thus two of the former difficulties in interpreting oxidation-reduction potentials were eliminated. These difficulties are the uncertainty in regard to liquid junction potentials and activity of one ion in the presence of other ions.[1]

2. Electromotive force measurements of the cell

$$Pt,\ H_2,\ HC10_4,\ HC10_4 + Hg\,(C10_4)_2 + Hg_2\,(C10_4)_2,\ Pt.$$

were made. The mode of attack was similar to that in a.

c. Attempts to measure the potentials of the permanganate ion hydrogen ion manganese dioxide electrode and that of the manganese dioxide, hydrogen ion, manganous ion electrode failed be-

1 Popoff and Kunz, J. Am. Chem. Soc. 51, 382 (1929).